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EXAMINER

ROYSTON, ELIZABETH

ART UNIT

PAPER NUMBER

1791

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/577,748	<b>Applicant(s)</b> FEUGIER ET AL.	
	<b>Examiner</b> Elizabeth Royston	<b>Art Unit</b> 1791	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 16 July 2009.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 18-34 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 18-34 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)         | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)         | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                          |

### **DETAILED ACTION**

1. Applicant's amendment to claims 18, 23, 27, 28, and 33 in the response filed 7/16/2009 is acknowledged and accepted.

2. Claims 18-34 as filed on 7/16/2009 are examined in the instant Official Action.

### ***Claim Rejections - 35 USC § 112***

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 18-34 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Specifically, the limitations in claim 18 of "the particulate material is not sieved before shaping" and "no binder is added to the powder of the particulate material before shaping" are not supported by the specification. The method step of specifically not sieving before shaping is not disclosed by Applicant and furthermore the concept of a binder, present or not, is not disclosed by the specification.

Art Unit: 1791

***Claim Objections***

5. Claim 34 is objected to because of the following informalities: the limitation "mixing the particulate material comprising uranium oxide  $\text{UO}_2$  obtained by agitation of the conversion powder in a presence of moving bodies with the plutonium oxide powder ..." can be interpreted as either the  $\text{UO}_2$  powder is agitated in the presence of moving bodies and then mixed with  $\text{PO}_2$  powder, or the  $\text{UO}_2$  powder is agitated and then mixed with  $\text{PO}_2$  powder in the presence of moving bodies. For purposes of examination and in light of the specification, page 7, line 23-31, the limitation is interpreted as the  $\text{UO}_2$  powder is agitated and then mixed with  $\text{PO}_2$  powder in the presence of moving bodies. In this case, suggested wording might be "mixing the particulate material comprising uranium oxide  $\text{UO}_2$  obtained by agitation of the conversion powder with the plutonium dioxide powder  $\text{PO}_2$  in the presence of moving bodies".

Appropriate correction is required.

***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

Art Unit: 1791

1. Determining the scope and contents of the prior art.
  2. Ascertaining the differences between the prior art and the claims at issue.
  3. Resolving the level of ordinary skill in the pertinent art.
  4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
8. Claims 18-23, 25 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over McCoy (US PN 3579311) in view of Hayes (US PN 4643873).

With regard to claim 18, McCoy teaches a method for manufacturing nuclear fuel pellets through sintering of a material containing uranium dioxide obtained from a powder originating from a process for a conversion of uranium hexafluoride  $UF_6$  comprising: obtaining the powder (col. 5, line 45) directly by the  $UF_6$  hexafluoride conversion process (col. 1, line 15-19); placing the powder in a mill containing moving, compressing, and mixing bodies (col. 4, line 7, the hammers in item 30); shaping the particulate material obtained by agitation in the mill into raw fuel pellets that undergo sintering wherein the particulate material is not sieved before shaping and no binder is added to the powder of the particulate material before shaping.

Although McCoy does not explicitly disclose agitating the mill such that the powder moves within a volume of the mill in three noncoplanar axes to be compressed between moving bodies and walls of the vessel, the agitation provided by a hammermill would intrinsically results in the powder moving within a volume of the mill in three noncoplanar axes to be compressed between moving hammers and surfaces of the vessel.

McCoy does not explicitly teach a vessel or the particulate material having a density in an uncompacted state of at least  $1.7 \text{ g/cm}^3$ .

Art Unit: 1791

Hayes teaches that ball milling the  $\text{UO}_2$  was known in the art in the time of the invention (col. 2, line 34-35), a method that intrinsically utilizes a vessel containing moving, compressing, and mixing bodies (the balls) where the agitation provided by the mill is such that the powder moves within a volume of the mill in three noncoplanar axes and is compressed between moving bodies and walls of the vessel.

Hayes also teaches a density of the particulate material after agitation in an uncompacted state of at least  $1.7 \text{ g/cm}^3$  (col. 3, line 42-43).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the agitation method in the teaching of Hayes to obtain the density of the particulate material after agitation in the teaching of Hayes in the method of making nuclear fuel pellets in the teaching of McCoy. The rationale to do so would have been the motivation provided by the teaching of Hayes, that to use such a method to obtain such a density predictably results in the formation of the complete break down of the three dimensional lattice of the powder particles into individual crystallites (col. 2, line 34-37) which prevents the collapse of the particles under the pressure of pellet compaction (col. 1, line 61-64).

With regard to claim 19, McCoy in view of Hayes teaches a method of ball milling  $\text{UO}_2$  powder (Hayes, col. 2, line 34-35). Since the ball mill is run by a motor, and since all motors inherently produce vibration, then the ball mill in the teaching of McCoy in view of Hayes would inherently have resulted in the vessel being subjected to a three-dimensional vibratory movement.

With regard to claims 20 and 21, McCoy does not explicitly disclose making  $\text{UO}_2$  from  $\text{UF}_6$  using a dry route conversion process or the properties of the particles associated therewith.

Hayes teaches a method of making  $\text{UO}_2$  from  $\text{UF}_6$  using a dry route conversion process (col. 1, line 48-51).

Although Hayes does not explicitly disclose a pre-agitation particle density of less than  $1 \text{ g/cm}^3$ , the dry route conversion process was known to create powders with densities less than  $1 \text{ g/cm}^3$  (Reese, table IV, Test numbers 1 and 5) where the density is directly dependent on the reaction temperature (Reese, col. 3, line 18-24; col. 6, line 12-18), as evidenced by Reese. It would have been obvious to one of ordinary skill in the art at the time of the invention to use a temperature in the dry conversion process in the teaching of Hayes suitable for creating particles with densities optimized for packing into fuel pellets, such as would be found through routine experimentation. Furthermore, since the materials agitated and the method of agitation are the same as that claimed by Applicant, the post-agitation particle density would have intrinsically been within the range claimed by Applicant.

Although McCoy in view of Hayes does not explicitly teach a flowability of zero, since the materials for making the product, the method for making the product, and the density of the product was the same as that claimed by Applicant, then the flowability of the product would have intrinsically been within the range claimed by Applicant.

Art Unit: 1791

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the method of making  $\text{UO}_2$  from  $\text{UF}_6$  as in the teaching of Hayes in the method for forming fuel pellets in the teaching of McCoy. The rationale to do so would have been the motivation provided by the teaching of Hayes that to use such a dry route conversion process predictably results in  $\text{UO}_2$  powder that is suitable for use in the formation of nuclear fuel pellets post milling (col. 1, line 4-6, 58-68; col. 2, line 1-7).

With regard to claims 22, 23, 25, 26, McCoy does not explicitly disclose the operating parameters of the vessel or the material or shape of the moving bodies.

Hayes teaches a method of operating the mill by agitating the powder for 300 minutes in a vessel using moving bodies comprising simple geometrically shaped spherical steel balls.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the ball mill, the operating parameters, and the grinding media in the teaching of Hayes as the milling method in the teaching of McCoy. The rationale to do so would have been the motivation provided by the teaching of Hayes, that to use such a method predictably results in the formation of an agitated powder with a complete break down of the three dimensional lattice of the particles into individual crystallites (col. 2, line 34-37) which prevents the collapse of the particles under the pressure of pellet compaction (col. 1, line 61-64).



Art Unit: 1791

9. Claim 19 is in the alternative rejected under 35 U.S.C. 103(a) as being unpatentable over McCoy (US PN 3579311) in view of Hayes (US PN 4643873), as applied for claims 18, 20-23, 25 and 26 above, and in further view of Sutcliffe (US PN 4284593).

In the alternative with regard to claim 19, Sutcliffe teaches that vibratory ball milling was known for comminuting (col. 1-2, line 66-68, 1-4) uranium oxide fuel materials (col. 4, line 49-52).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the vibratory ball milling in the teaching of Sutcliffe as the milling process in the teaching of McCoy in view of Hayes as vibratory ball milling predictably results in the formation of successfully comminuted uranium oxide powder (col. 1, line 66-67).

10. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over McCoy (US PN 3579311) in view of Hayes (US PN 4643873), as applied for claims 18-23, 25 and 26 above, and in further view of Zimmerman (US PN 5238304).

With regard to claim 24, McCoy in view of Hayes does not explicitly disclose cylindrical grinding media.

Zimmermann teaches that spherical and cylindrical grinding media were known in the art at the time of the invention as grinding media for vibrating ball millers (col. 2, line 17-27).

Art Unit: 1791

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the cylindrical grinding media in the teaching of Zimmermann as the grinding media in the method of McCoy in view of Hayes. The rationale to do so would have been the motivation provided by the teaching of Zimmermann, that to use such a grinding media shape predictably results in the selection of a grinding media well suited to activities such as pulverizing materials or preventing loss of material in vibrating ball mills depending on the operational parameters (col. 2, line 20-26).

11. Claims 27-31, and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over McCoy (US PN 3579311) in view of Hayes (US PN 4643873) and Zimmerman (US PN 5238304), as applied for claims 18-26 above, and in further view of Butler (US PN 3995000) and Une (JP 04279895 A).

With regard to claims 27-31, 33, McCoy in view of Hayes and Zimmerman does not explicitly disclose adding at least 0.01% pore forming agent to the already formed  $\text{UO}_2$  powder prior to agitation.

Butler teaches adding 1.7 wt% ammonium oxalate pore-forming agent to a  $\text{UO}_2$  powder prior to mixing of the components (col. 2, line 19).

Furthermore, Une teaches that it was known in the art at the time of the invention to include additives, including lubricant, with the  $\text{UO}_2$  powder prior to mixing the components in a ball mill (abstract, line 6-11).

Although Butler does not explicitly teach milling the components together, it would have been obvious to one of ordinary skill in the art at the time of the invention to

Art Unit: 1791

use the ball mill in the teaching of McCoy in view of Hayes to mix the components such as in the teaching of Une. Furthermore it would have been obvious to one of ordinary skill in the art at the time of the invention to add the components together prior to milling, as in the teaching of Une, using the materials in the teaching of McCoy in view of Hayes and Butler. The rationale to do so would have been the motivation provided by the teaching of Une, that to mix the components using such an order of steps predictably results in the formation of mixtures with uniformly dispersed materials (Une, abstract, line 3).

Furthermore, although McCoy in view of Hayes, Butler, and Une do not explicitly teach adding material during the course of the agitating treatment, it would have been obvious to one of ordinary skill in the art at the time of the invention to add materials so as to optimize the final mixture in terms of material dispersion and to optimize the time required for individual additives to be mixed before the desired mixture properties are obtained.

Although Une does not explicitly teach that the lubricant is covering the particulate surfaces, since the materials and method in the teaching of Une are the materials and method as claimed by Applicant, the lubricant in the teaching of Une would have intrinsically covered the particulate surfaces in the mixture.

It would have been obvious to one of ordinary skill in the art at the time of the invention to add the pore-forming agent in the teaching of Butler with the  $\text{UO}_2$  powder in the teaching of McCoy in view of Hayes, since creating low density fuel pellets was known in the art at the time of the invention. The rationale to do so would have been

Art Unit: 1791

the motivation provided by the teaching of Butler, that to add an ammonium oxalate pore forming agent predictably results in the formation of low density fuel pellets (col. 1, line 7) containing a large range of pore sizes over a wide density range without changing the sintering characteristics of the pellet (col. 1, line 35-39).

12. Claims 32 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over McCoy (US PN 3579311) in view of Hayes (US PN 4643873), as applied for claims 18-23, 25 and 26 above, and in further view of Bauer (US PN 5841200) and Vandergheynst (US PN 2006/0188053 A1).

With regard to claim 32, McCoy in view of Hayes does not explicitly disclose the addition of  $\text{PuO}_2$  prior to agitation or the use of a containment enclosure, although McCoy in view of Hayes does teach that the mixing of  $\text{PuO}_2$  and additives with the  $\text{UO}_2$  powder may be achieved at any time during the process (col. 3, line 19-23).

Bauer teaches that it was known in the art at the time of the invention to add the  $\text{PuO}_2$  and  $\text{UO}_2$  powders (col. 1, line 32) prior to agitation (col. 1, line 33)

Vanderghenst teaches that minimizing contact of radioactive materials such as uranium oxide and plutonium oxide (paragraph 4, line 5) is accomplished through enclosing and shielding the radioactive materials and operations within containment enclosures, in addition to mechanizing and automating most if not all of the process. If the processes were mechanized, since the goal of the mechanization and enclosures was to minimize human contact with the radioactive material, it would have been

Art Unit: 1791

obvious to one of ordinary skill in the art at the time of the invention to place the controls for the mechanized processes outside of the enclosure.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the order of steps in the teaching of Bauer in the method in the teaching of McCoy in view of Hayes. The rationale to do so would have been the motivation provided by the teaching of Bauer, that to use such an order of steps predictably results in a mixture where the powder agglomerates are destroyed and the constituents and fragments of the powder particles are thoroughly mixed as to increase the mixture's sintering aptitude (col. 1, line 35-37).

It would have been obvious to one of ordinary skill in the art at the time of the invention to place the radioactive material and operations in the teaching of McCoy in view of Hayes and Bauer using the containment enclosures in the teaching of Vandergheynst. The rationale to do so would have been the motivation provided by the teaching of Vandergheynst, that to use such enclosures predictably results a minimized direct human intervention on the process and therefore increased safety (paragraph 5, line 1-2, 8-9).

With regard to claim 34, although McCoy in view of Hayes, Bauer, and Vandergheynst teach mixing the particulate material comprising  $\text{UO}_2$  with a  $\text{PuO}_2$  powder before shaping of the pellets for the production of mixed uranium oxide plutonium oxide fuel pellets (Bauer, col. 1, line 32-33, 45-46), McCoy in view of Hayes, Bauer, and Vandergheynst do not explicitly teach mixing the particulate material

Art Unit: 1791

comprising  $\text{UO}_2$  obtained by agitation of the conversion powder with a  $\text{PuO}_2$  powder in a presence of moving bodies.

However, it would have been obvious to one of ordinary skill in the art at the time of the invention to change the order of steps and mix the particulate material comprising  $\text{UO}_2$  obtained by agitation of the conversion powder with a  $\text{PuO}_2$  powder in a presence of moving bodies, since it was known in the art at that time to add  $\text{PuO}_2$  material to a mixture of comminuted  $\text{UO}_2$  powder at any point in the mixing process (Hayes, col. 3, line 19-23), and to mix the materials together using moving bodies (Bauer, col. 1, line 32-33).

### ***Response to Arguments***

13. Applicant's arguments with respect to claims 18-34 have been considered but are moot in view of the new ground(s) of rejection.

14. Applicant's arguments filed 7/16/2009 have been fully considered but they are not persuasive.

With regard to Applicant's argument that there is no motivation to combine the teaching of Hayes with the teaching of Butler, the Examiner respectfully disagrees. Although Hayes does teach a method of manufacturing dense nuclear fuel pellets, Butler teaches that it was known in the art at the time of the invention to also make low density nuclear fuel pellets, and that the ammonia additive was known for forming pores in the pellet material. It would have been obvious to one of ordinary skill in the art at the

Art Unit: 1791

time of the invention that if low density fuel pellets were desired, to add the ammonia additive in the teaching of Butler to the material in the teaching of Hayes to form low density pellets.

### ***Conclusion***

15. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Elizabeth Royston whose telephone number is 571-270-7654. The examiner can normally be reached on M-Th 8:00am - 5:00pm.

Art Unit: 1791

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Christina Johnson can be reached on (571) 272-1176. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/ER/

Patent Examiner, GAU 1791

/Christina Johnson/

Supervisory Patent Examiner, Art Unit 1791